

**REMARKS**

Upon entry of this amendment, claims 1-3 and 10 are pending in the application. Claim 1 is an independent claim drawn to an apparatus for processing heavy hydrocarbon feed, and the remaining claims depend therefrom. Claims 1 and 10 have been amended to further clarify what the Applicant considers to be the invention and to clarify the distinctions between the inventive subject matter and the prior art references. Applicant further submits that the amendments to the claims do not add new matter within the meaning of 35 U.S.C. §132.

The esteemed Examiner has withdrawn the rejection of the claims as being indefinite, for which the Applicant is grateful. However, Claims 1-3 and 10 stand rejected as being obvious over the van Klinken et al. patent (U.S. Patent No. 4,039,429).

**Rejection of Claims 3 and 10 Under 35 U.S.C. 103(a)**

Claims 1-3 and 10 stand rejected under 35 U.S.C. 103(a) as being obvious over van Klinken et al. (U.S. Patent No. 4,039,429). As a basis for the rejection, the Office Action states:

With regard to claim 1, van Klinken discloses a heater for heating the heavy hydrocarbons and an atmospheric fractionating tower for fractionating the heated heavy hydrocarbon feed. Van Klinken calls this combination a "First Atmospheric Distilling Zone (Figure 1(2)). Since a still contains both a heat source and a fractionating tower, van

Klinken's description "atmospheric distilling zone" is equivalent to the heater and an atmospheric fractionating tower of the present invention.

Van Klinken discloses a further heater and a vacuum fractionating tower ("First Vacuum Distilling Zone" Figure 1 (3)).

Van Klinken discloses a solvent deasphalting (SDA) unit (Figure 1 (4)).

Van Klinken discloses a thermal cracker (cracker (10) operates at 450°C to 525°C, column 3 line 50, and thus is thermal as well as catalytic).

Van Klinken discloses a thermal cracker (10) for cracking the deasphalted oil,

Van Klinken fails expressly to disclose a further cracker for thermally cracking the light vacuum fractions. Since van Klinken discloses thermally cracking the light vacuum fractions in a cracker (10), as well as cracking the deasphalted oil in a cracker (10) at the time of the invention it would have been obvious to one skilled in the art to use two crackers instead of one. This would be an obvious modification, since it has been held that mere duplication of parts has no patentable significance unless new and unexpected results are produced. In re Harza, 124 U.S.P.Q. 378 (C.C.P.A. 1960).

While van Klinden fails expressly to disclose that the cracked light vacuum fraction is recycled to the inlet of the atmospheric fractionating tower, since one of the outputs of the apparatus of van Klinken (43) is considered residue (column 7 line 43) and since the apparatus of van Klinken used residue as its input stream (Abstract), it would have been obvious to recycle the output (43) to the inlet (13) of the system. The motivation would have been to convert a residue stream to a light distillate (Abstract).

With regard to claim 2, van Klinken discloses means (21) for supplying only the heavy portion of the light vacuum fraction to the thermal cracker.

With regard to claims 3 and 10, the apparatus of van Klinken includes essentially the same apparatus as the present claim, including a hydrotreater (9), a heater and atmospheric fractionating unit (Figure 1 (11), the distilling zone includes a heater and fractionating tower) but fails expressly to disclose an additional vacuum fractionating apparatus.

Van Klinken discloses an atmospheric fractionating tower (2) followed by a vacuum fractionating tower (3). At the time

of the invention it would have been obvious to one skilled in the art to follow the atmospheric fractionating tower (Figure 1 (11)) with a vacuum fractionating tower as was done with the upstream atmospheric fractionating tower (Figure 1 (2)).

The motivation would have been to further separate the process stream into fractions, just as was done upstream by the atmospheric fractionating tower (2) and the vacuum fractionating tower (3).

#### **RESPONSE**

Applicant respectfully traverses this rejection and requests reconsideration and withdrawal thereof.

The reference of record, van Klinken et al., does not teach or suggest applicants' inventive subject matter as a whole, as recited in the amended claims. Further, there is no teaching or suggestion in this reference which would lead the ordinary skilled artisan to modify the reference to derive the subject matter as defined in the amended claims.

The U.S. Supreme Court in *Graham v. John Deere Co.*, 148 U.S.P.Q. 459 (1966) held that non-obviousness was determined under § 103 by (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; (3) resolving the level of ordinary skill in the art; and, (4) inquiring as to any objective evidence of nonobviousness.

**A. The Present Inventive Subject Matter**

As amended, claim 1 is drawn to an apparatus of processing heavy hydrocarbon feed comprising: a heater for heating said heavy hydrocarbon feed; an atmospheric fractionating tower for fractionating the heated heavy hydrocarbon feed fed to the inlet of the atmospheric fractionating tower producing light atmospheric fractions and atmospheric bottoms; a further heater for heating said atmospheric bottoms and producing heated atmospheric bottoms; a vacuum fractionating tower for fractionating said heated atmospheric bottoms and producing light vacuum fractions and vacuum residue; a solvent deasphalting (SDA) unit for producing deasphalted oil (DAO) and asphaltenes from said vacuum residue; a thermal cracker for thermally cracking said deasphalted oil and producing a thermally cracked product which is recycled to the inlet of of said atmospheric fractionating tower; and a further thermal cracker for only thermally cracking said light vacuum fractions for producing a further thermally cracked product which is recycled to the inlet of said atmospheric fractionating tower.

The remaining claims depend from claim 1 and therefore contain all of the limitations found in claim 1. Therefore, if claim 1 is not obvious over the reference, the remaining claims are likewise not obvious over the reference.

**B. The Prior Art**

In contrast, van Klinken (U.S. Patent No. 4039,429) discloses a combination of processes that are designed to convert atmospheric reduced crude to light products through conversion by Fluid Catalytic Cracking (FCC). Van Klinken discloses several combinations of vacuum distillation, visbreaking, deasphalting and FCC to obtain light products.

**C. Differences between the Claimed Subject Matter  
and the Prior Art**

The differences between applicants' inventive subject matter and the cited references are readily apparent from their independent and distinct disclosures. As can be seen from amended claim 1, in the thermal crackers of the presently claimed inventive subject matter, the deasphalted oil and light vacuum fractions are only thermally cracked, not catalytically cracked as is required in van Klinken. Further, claim 1 requires an atmospheric fractionating tower for fractionating the heated heavy hydrocarbon feed as well as a vacuum fractionating tower for fractionating the heated atmospheric bottoms produced by the atmospheric fractionating tower. Further, claim 1 requires a thermal cracker for only thermally cracking (not catalytically cracking) the

deasphalted oil produced by the solvent deasphalting unit and a further thermal cracker for only thermally cracking the light vacuum fractions produced by the vacuum fractionating tower. In addition, the thermally cracked product from each of the thermal crackers is recycled to the atmospheric fractionating tower in which the heated heavy hydrocarbon feed is fed. ←

In contrast, van Klinken discloses an apparatus in which atmospheric reduced crude is treated and converted. The process in which van Klinken treats the atmospheric reduced crude is by Fluid **Catalytic** Cracking (FCC). The Examiner argues on page 3 of the present Office Action that "van Klinken discloses a thermal cracker (cracker (10) operates at 450°C to 525°C, column 3 line 50, and thus is thermal as well as catalytic)." However, Applicants respectfully submit that a careful reading of the 3<sup>rd</sup> column of the van Klinken patent reveals that the cracker utilized in the patent is for catalytic cracking, especially since van Klinken indicates as much at lines 24-25 when he states "In the process according to the invention **catalytic** cracking constitutes the main process." (Emphasis added). Therefore, van Klinken is concerned **only with catalytic cracking, and not thermal cracking, as is called for in the presently claimed invention.**

Furthermore, Applicants respectfully submit that van Klinken

fails to disclose the arrangement of the elements of the claim and the two thermal crackers, with the thermally cracked product being recycled to the initial atmospheric distillation column. The Examiner argues that it would have been obvious to modify van Klinken in an effort to obtain the presently claimed invention, however, even if van Klinken were modified as indicated by the Examiner, the result would still not achieve the presently claimed subject matter because van Klinken calls for **catalytic cracking**, while the present invention calls for **thermal cracking**, as is discussed above. Such an omission would render the van Klinken patent different from the present claims, and thus there would be no motivation to alter van Klinken to attempt to achieve the present inventive subject matter.

Claims 2, 3 and 10 add a further set of elements to the apparatus of claim 1. The additional elements as arranged and claimed in claims 2, 3 and 10 are not disclosed in the van Klinken patent. In particular, the presence and arrangement of the hydrotreater, further atmospheric fractionating column, and additional vacuum fractionating column are not disclosed in the van Klinken patent. Further, since van Klinken discloses Fluid Catalytic Cracking as the process for cracking the atmospheric reduced crude, there is no motivation to include these additional elements in the apparatus of van Klinken in an effort to obtain the

Attorney Dkt. No. P-15149  
Serial No. 09/431,159  
Filed: November 1, 1999

claimed subject matter. Accordingly, Applicant respectfully submits that claims 1-3 and 10 are not rendered obvious by van Klinken, as there is no motivation or teaching to modify van Klinken in an effort to obtain the presently claimed subject matter.

Applicants respectfully request reconsideration and withdrawal of the rejection of claims 1-3 and 10 as being obvious over van Klinken et al.

#### **CONCLUSION**

In view of the foregoing, applicants respectfully request the Examiner to reconsider and withdraw the all pending rejections, and to allow all of the claims pending in this application.

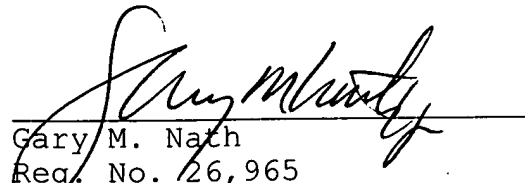
If the Examiner has any questions or comments regarding this matter, he is welcomed to contact the undersigned attorney at the below-listed number and address.

Respectfully submitted,

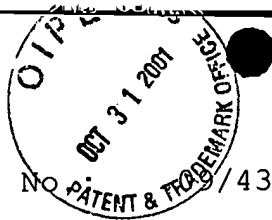
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Serial No. 431,159

Group Art Unit: 1764

Filed: November 1, 1999

Examiner: R. Varcoe Jr.

For: **METHOD OF AND APPARATUS FOR PROCESSING HEAVY  
HYDROCARBON FEEDS**

**ATTACHMENT A - MARKED-UP COPY OF CLAIM AMENDMENTS**

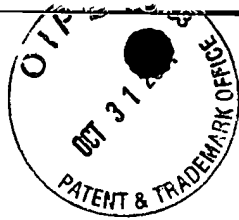
Please amend claims 1 and 10 as follows:

1. (Amended) Apparatus of processing heavy hydrocarbon feed comprising:

- a) a heater for heating said heavy hydrocarbon feed;
- b) an atmospheric fractionating tower for fractionating the heated heavy hydrocarbon feed fed to the inlet of the atmospheric fractionating tower producing light atmospheric fractions and atmospheric bottoms;
- c) a further heater for heating said atmospheric bottoms and producing heated atmospheric bottoms;
- d) a vacuum fractionating tower for fractionating said heated atmospheric bottoms and producing light vacuum fractions and vacuum residue;
- e) a solvent deasphalting (SDA) unit for producing deasphalted oil (DAO) and asphaltenes from said vacuum residue;
- f) a thermal cracker for thermally cracking said deasphalted oil and producing a thermally cracked product which is recycled to the inlet of of said atmospheric fractionating tower; and
- g) a further thermal cracker for only thermally cracking said light vacuum fractions for producing a further thermally cracked product which is recycled to the inlet of said atmospheric fractionating tower.

10. (Amended) Apparatus according to claim 1 including:

- a) a hydrotreater for processing the lighter portion of said light vacuum fractions and producing a treated, hydrocarbon



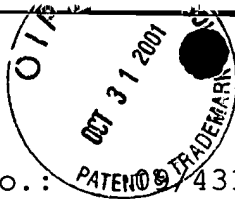
stream;

[g)] b) a still further heater for heating said treated, hydrocarbon stream for producing a heated, treated, hydrocarbon stream

[b)] c) a still further atmospheric fractionating column for producing from said heated, hydrocarbon stream further light atmospheric fractions and further atmospheric bottoms;

[c)a still] d) an even further heater for heating said further atmospheric bottoms producing heated, further atmospheric bottoms; and

[d)] e) a still further vacuum fractionating column for producing further lighter vacuum fractions and further vacuum residue such that the heavier portion of said further light vacuum fractions is supplied together with said deasphalted oil to said thermal cracker.



Serial No.: PATENT 431,159

Group Art Unit: 1764

Filed: November 1, 1999

Examiner: R. Varcoe Jr.

For: **METHOD OF AND APPARATUS FOR PROCESSING HEAVY  
HYDROCARBON FEEDS**

**ATTACHMENT B - CLEAN COPY OF AMENDED CLAIMS**

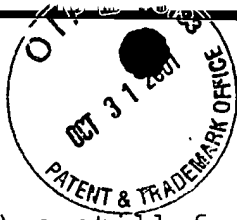
Please amend claims 1 and 10 as follows:

1. (Amended) Apparatus of processing heavy hydrocarbon feed comprising:

- C1
- a) a heater for heating said heavy hydrocarbon feed;
  - b) an atmospheric fractionating tower for fractionating the heated heavy hydrocarbon feed fed to the inlet of the atmospheric fractionating tower producing light atmospheric fractions and atmospheric bottoms;
  - c) a further heater for heating said atmospheric bottoms and producing heated atmospheric bottoms;
  - d) a vacuum fractionating tower for fractionating said heated atmospheric bottoms and producing light vacuum fractions and vacuum residue;
  - e) a solvent deasphalting (SDA) unit for producing deasphalted oil (DAO) and asphaltenes from said vacuum residue;
  - f) a thermal cracker for thermally cracking said deasphalted oil and producing a thermally cracked product which is recycled to the inlet of said atmospheric fractionating tower; and
  - g) a further thermal cracker for only thermally cracking said light vacuum fractions for producing a further thermally cracked product which is recycled to the inlet of said atmospheric fractionating tower.

10. (Amended) Apparatus according to claim 1 including:

- C2
- a) a hydrotreater for processing the lighter portion of said light vacuum fractions and producing a treated, hydrocarbon



stream;

b) a still further heater for heating said treated, hydrocarbon stream for producing a heated, treated, hydrocarbon stream

c) a still further atmospheric fractionating column for producing from said heated, hydrocarbon stream further light atmospheric fractions and further atmospheric bottoms;

C2 d) an even further heater for heating said further atmospheric bottoms producing heated, further atmospheric bottoms; and

e) a still further vacuum fractionating column for producing further lighter vacuum fractions and further vacuum residue such that the heavier portion of said further light vacuum fractions is supplied together with said deasphalted oil to said thermal cracker.

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